PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 16 February 2001 (16.02.01)	
International application No. PCT/SE00/01257	**Applicant's or agent's file reference** P 00-818/IJW
International filing date (day/month/year) 15 June 2000 (15.06.00)	**Priority date** (day/month/year) 17 June 1999 (17.06.99)
Applicant BACKLUND, Hans-Olof et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

08 January 2001 (08.01.01)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

A. Karkachi

Telephone No.: (41-22) 338.83.38

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/01257

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B02C 7/14, D21B 1/14, D21D 1/30
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B02C, D21B, D21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 407952 B (DEFIBRATOR AB), 30 April 1979 (30.04.79), figures 1,2, claims 1,2	1,4

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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 October 2000	18 -10- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Wiva Asplund/ELY Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

03/10/00

International application No.
PCT/SE 00/01257

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
SE 407952 B	30/04/79	BR 7700559 A	04/10/77
		CA 1053050 A	24/04/79
		DE 2702735 A	04/08/77
		FI 64665 B,C	31/08/83
		FI 770251 A	31/07/77
		FR 2339703 A,B	26/08/77
		GB 1546978 A	06/06/79
		JP 52110907 A	17/09/77
		SE 7601019 A	31/07/77
		US 4148439 A	10/04/79

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

16

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
P 00-818 IJW/uh		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/SE00/01257	15.06.2000	17.06.1999
International Patent Classification (IPC) or national classification and IPC7		
B 02 C 7/14, D 21 B 1/14, D 21 D 1/30		
Applicant		
Valmet Fibertech AB et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08.01.2001	26.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Telex 17978 PATOREG-S Facsimile No. 08-667 72 88	Authorized officer Wiva Asplund/ELY Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/01257

I. Basis of the report

1. With regard to the **elements** of the international application:*

☒ the international application as originally filed

☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-13	YES
	Claims		NO
Inventive step (IS)	Claims	1-13	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-13	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The document cited in the International Search Report represents the prior art. The claimed invention stated in claims 1-13 is not considered to be anticipated by this document. The document does not reveal a method and a device for measuring stress forces in refiners at which the measuring surface comprises at least parts of more than one bar and is resiliently mounted in the surface of the refining disc as described by these claims.

According to the arguments stated above, the invention claimed in claims 1-13 is novel, considered to involve an inventive step and have industrial applicability.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

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28 December 2000 (28.12.2000)

PCT

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(25) Filing Language: English

(26) Publication Language: English

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9902306-1 17 June 1999 (17.06.1999) SE

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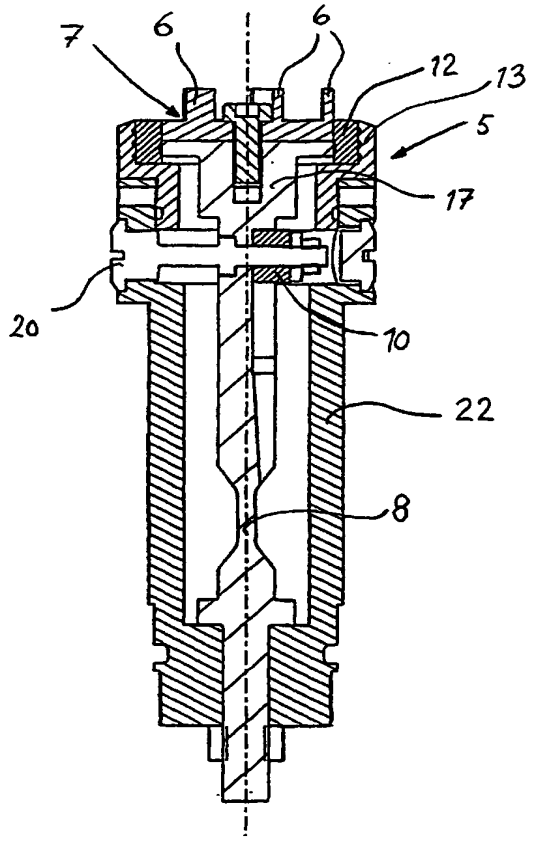
(74) Agents: **JOHANSSON WEBJÖRN, Ingmari** et al.; L.A. Groth & Co.KB, P.O. Box 6107, S-102 32 Stockholm (SE).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian

[Continued on next page]

(54) Title: A METHOD AND MEANS FOR MEASURING STRESS FORCES IN REFINERS



(57) Abstract: The invention relates to a method and a device for measuring stress forces in refiners having refining discs that between them define a refining gap for refining material between bars (3) arranged on the refining discs. According to the invention measurement is performed across a measuring surface (7) constituting a part of a refining disc, and said measuring surface comprises at least parts of more than one bar (6).

WO 00/78458 A1

patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— *With international search report.*

— *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

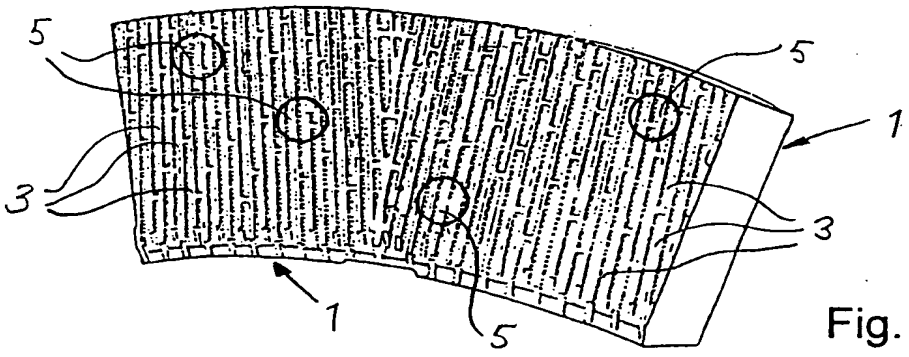


Fig. 1

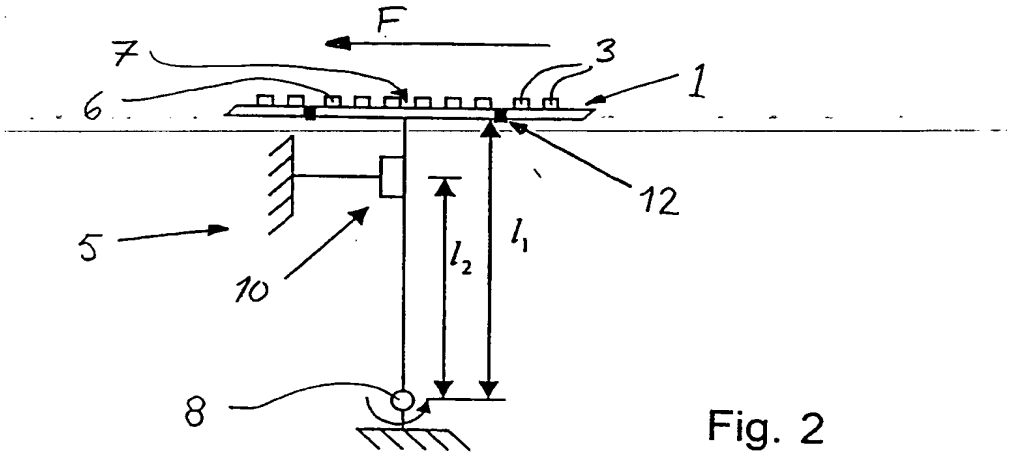


Fig. 2

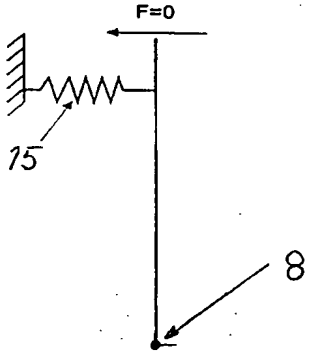


Fig. 3a

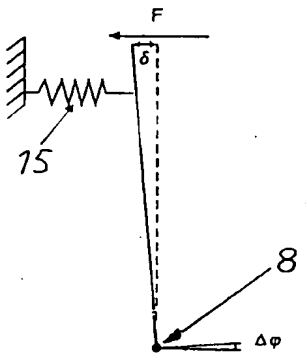


Fig. 3b

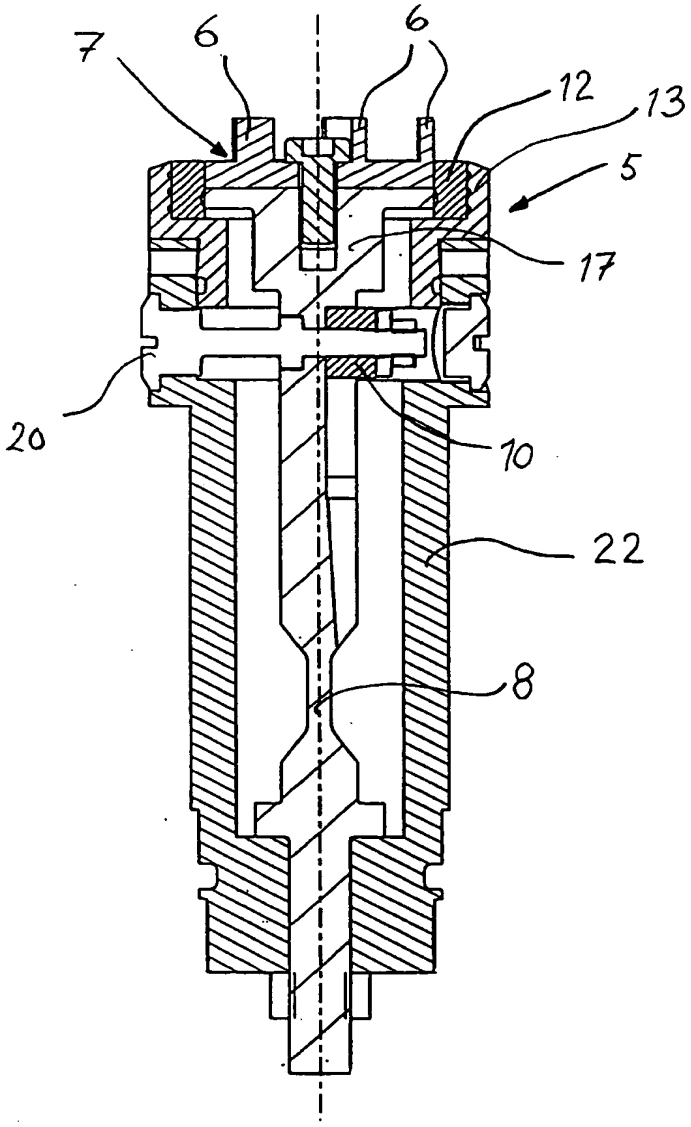


Fig. 4

A METHOD AND MEANS FOR MEASURING STRESS FORCES IN REFINERS

The present invention relates to a method and a measuring device for measuring stress forces in refiners having refining discs that between them define a refining gap for refining material.

Such refiners are using for refining material containing fiber. The refiner generally comprises refining members in the form of discs which rotate in relation to each other and between which the material for refining passes from the inner periphery of the refining members, where the material is supplied, to the outer periphery of the refining members, through a refining gap formed between the refining members. Often one of the refining discs is fixed whereas the other rotates. The refining discs are generally constructed from segments provided with bars. The inner segments then have a coarser pattern and the outer segments a finer pattern in order to produce fine refining of the material.

To ensure high quality when refining material containing fiber, the disturbances in operating conditions that continually occur for various reasons must be corrected by constant control of the various refining parameters to optimum values. This can be achieved by altering the supply of water, for instance, so that a larger or smaller cooling effect is obtained, by changing the flow of material for refining, by adjusting the distance between the refining members, or a combination of these measures. Accurate determination of the energy transferred to the material for refining, and also of the distribution of the energy over the surface of the refining members, are necessary to enable the necessary adjustments and corrections to be performed.

To determine the energy/output transferred to the material for refining, it is already known to try to measure the shear forces appearing in the refining zone. What is known as a shear force occurs when two surfaces move in relation to each other with a viscous liquid between the surfaces. Such a shear force is also created in a refiner used for refining wood chips mixed with water. It may be imagined that the chips of wood are both sheared and rolled between the refining discs, as well as colliding with each other and the bars. The shear force is caused, inter alia, by the combined force of the discs and by the friction coefficient. The normal force exerted on the surface also varies with the radius.

Through SE-C-504801 a measuring device is already known comprising a special sensor bar, i.e. a bar provided with sensors which sense the load exerted on the sensor bar during refining, at a number of measuring points along the bar. However, the drawback of this arrangement is that measuring is only performed on occasional bars and the result is therefore unreliable. Furthermore, the type of transducer, strain gauge, used in bar experiments have a short service life since

the transducers are located close to the refining surface and the material used to screen the transducers from steam and pulp is subjected to an extremely demanding environment. However, despite these drawbacks, strain gauges must be used because of the design of this measuring device.

The object of the present invention is to solve the problems mentioned above and, first of all, to provide a method and a measuring device that produces a more reliable result than previously known devices, and also to provide a device with potential for a longer service life than previously known devices, thus making it more economical.

This object is achieved by a method as defined in claim 1 and with the characteristics specified therein, and also with a measuring device as defined in claim 4.

The method is thus characterised in that measurement of the force stress is performed across a measuring surface constituting a part of a refining disc, said measuring surface comprising at least parts of more than one bar and being resiliently mounted in relation to the surface of the refining disc. The measuring device is provided with corresponding means for performing the method. The present invention thus reveals the advantage that, in comparison with known technology, measurement of the stress force is performed over a relatively large surface, thereby producing a considerably more reliable result.

According to a preferred embodiment, measurement is performed by the measuring surface being resiliently journalled in a direction parallel with the surface of the refining disc and being movable in said direction in the event of a stress force, in relation to a rigidly mounted force sensor with which the measuring surface is connected, said force sensor thus being influenced by and measuring said stress force. The measuring device in turn reveals features comprising equivalent members.

According to a particularly preferred feature, therefore, the measuring device comprises a force sensor and a body connecting the sensor with the measuring surface. Through this arrangement the present invention achieves the advantage that the force stress is measured directly, instead of indirectly by measurement of linear strain and the like, as occurs with known technology.

The sensor, which is preferably a piezoelectric force sensor constructed of quartz crystal (a "quartz sensor") also contributes to an extremely rigid measuring device being possible. The preferred sensor will withstand temperatures of up to 200°C and is also linear up to this temperature.

In accordance with another preferred feature, the measuring surface is connected to said body and the part of said body that extends on the side of the

force sensor opposite to the measuring surface, is provided with a joint where the body is movable in a direction substantially parallel with the surface of the refining disc. However, as mentioned above, since the force sensor has a relatively stiff spring action, the shear forces will only cause extremely small movements in the joint, and thus the measuring device. This makes it easier to seal the measuring device against steam and wood chips penetrating from the surroundings, neither will it be as sensitive to material that accumulates around the measuring device. These are important advantages over the known technology. In the direction perpendicular to the measuring surface, the body has such a high degree of rigidity that no changes will occur in the refining gap, which is another advantage.

Additional advantages and features of the invention are revealed in the sub-claims.

The present invention will now be described with reference to the embodiment illustrated in the accompanying drawings, in which

Figure 1 shows a view in perspective of a refining segment forming part of a refining disc, provided with measuring devices in accordance with the present invention;

Figure 2 shows a basic layout sketch of a measuring device in accordance with the present invention;

Figures 3a and 3b illustrate the force ratio applicable for the invention; and

Figure 4 shows a view, partly in section, of a measuring device in accordance with the present invention.

Figure 1 thus illustrates a part of a refining disc in the form of a refining segment 1, provided with a pattern comprising a number of bars 3 extending in substantially radial direction. Measuring devices 5, in accordance with the present invention, are also illustrated schematically in this figure. These measuring devices preferably have a circular measuring surface, with a diameter in the order of magnitude of 30 mm, for instance, but the measuring surface may also have a different geometric shape. The measuring devices are preferably arranged at different radial distances from the centre of the refining disc, and segments at different distances from the centre are also preferably provided with measuring devices. It is also advantageous for the measuring devices to be staggered peripherally in relation to each other, all with the object of being able better to determine the force distribution in the refiner and thus better to control the refining process. When a measuring device is affected by a force parallel with the surface of the refining disc/segment, the force sensor of the measuring device will generate a signal that is proportional to the load.

The measuring device according to the invention functions in accordance with the principle illustrated in figure 2. A disc segment 1 can be seen here from

the side, equipped with bars 3. A measuring device 5 is also visible, comprising a part of the surface of the disc segment and being provided with a number of bars 6, or at least parts thereof. When the refining disc is subjected to a shear load F, the measuring device 5 (the sensor) will take up a load F_m which is denoted by the following expression:

$$F_m = F \cdot \frac{l_1}{l_2} \qquad (1)$$

where l_2 is the distance between the point where a sensor 10 in the measuring device is secured and the joint 8 of the device, and where l_1 is the distance between the measuring surface 7 of the measuring device and the joint 8. This formula is valid provided the joint does not take up any torque, and that the pressure distribution over the measuring surface 7 subjected to the shear force is not too uneven. The joint 8 consists in principle of a metal sheet of such small thickness as to give a negligible contribution to the total stiffness of the measuring device while at the same time being able to withstand the loads to which it is subjected. The thickness of the metal sheet can at the same time be rather large since the sensor itself is relatively rigid, giving little flexure in the sheet. The dimension of the joint 8 shall thus be adjusted to withstand the vertical load occurring, while at the same time absorbing only a negligible part of the lateral load that the screw and the sensor shall absorb. See also the detailed description in conjunction with figure 4.

The model in figures 3a and 3b describes how high and low rigidity, respectively, affect the function of the measuring device, through the rigidity that sensor, attachment screw (the attachment member by which the sensor is fixed in relation to the measuring surface and the body, see Fig. 4) and joint possess. The force and the torque absorbed by the sensor/attachment screw and the joint, respectively, are controlled by the ratio $F_{sensor} = k_2 \cdot \delta$ and $M = k_3 \cdot \Delta\varphi$, where M is the torque in the joint. k_2 is in this case the rigidity of the spring 15, that is to say the sensor 10 together with the attachment screw 20, and k_3 is the rigidity of the journalling point/joint 8. The ratio shows clearly that if F = constant and k_2 increases, then δ will decrease, and thus also M since the torque is directly proportional to the flexure δ for small angles. In the case under discussion k_2 is large and the equation (1) is therefore valid.

It should be pointed out that, in this case, relatively high rigidity of the sensor/attachment screw results in high rigidity in relation to the load that the sensor/screw shall absorb. The load may vary greatly across the refining zone, e.g. from an order of magnitude of 20N to an order of magnitude of 150N. In the present case, with an estimated average value of about 40N, displacements of the measuring surface are obtained that can be measured in hundredths of a millimetre. As mentioned earlier, these minor displacements facilitate sealing the device from the surrounding environment. As to the body 17, this can be considered as completely rigid in the direction perpendicular to the measuring surface.

Figure 4 shows a preferred embodiment of a measuring device in accordance with the present invention. The measuring device 5 comprises a measuring surface 7 provided with bars 6, or parts of bars, which measuring surface constitutes a part of a disc segment as illustrated in figure 1. As can also be seen in figure 1, the measuring device has a preferably circular measuring surface.

The measuring surface 7 is in direct contact with a body 17, preferably of steel, extending inside the device. The measuring surface is preferably screwed to the body 17. Slightly below the measuring surface the body 17 is provided with a transverse recess in which a force sensor 10 is arranged, preferably a quartz sensor. Here, too, the body 17 is provided with a through hole in which an attachment screw 20 is applied, passing through the hole and securing the sensor 10. The sensor 10 is thus fixed in relation to the body 17 by means of the screw 20, as will be described below. Other attachment means for the sensor 10 are naturally possible. Otherwise, the body 17 preferably has a circular cross section. Further down beneath the sensor, the body 17 assumes a narrowing, flattened shape in an area corresponding to the joint 8, mentioned earlier, and described in conjunction with figures 2, 3a and 3b.

The sensor 10 and the body 17 are arranged inside a protective casing 22. This casing has an opening at the top, adjacent to the surrounding refining segment, which is closed by the measuring surface 7, a seal 12 surrounding the measuring surface, and a sleeve 13 in which the seal is arranged. The seal 12 is of a particularly suitable, somewhat yielding material such as rubber, so that it can permit the small movements that the shear forces give rise to in the measuring surface, and still achieve a good seal that prevents steam and pulp from penetrating into the device. The seal preferably has a dampening effect as regards, inter alia, the vibrations that occur during operation. The purpose of the sleeve 13 is primarily to facilitate sealing of the measuring device since the measuring surface and the seal are first assembled in the sleeve which can then easily be inserted partially into the casing 22. Naturally, it is possible to omit the sleeve.

The casing 22 also has a function in securing the sensor 10 in relation to the measuring surface 7. The sensor is thus secured in the casing by means of the attachment screw 20. Finally, the body 17 is attached in the casing at the end opposite to the measuring surface.

The invention is not limited to the embodiment illustrated in the drawings. It can be modified and altered in many ways obvious to one skilled in the art, within the scope of the appended claims.

CLAIMS

1. A method for measuring stress forces in refiners having refining discs that between them define a refining gap for refining material between bars (3) arranged on the refining discs, **characterized** in that measurement is performed across a measuring surface (7) constituting a part of a refining disc, said measuring surface comprising at least parts of more than one bar (3) and being resiliently mounted in relation to the surface of the refining disc.

2. A method as claimed in claim 1, **characterized** in that measurement is performed by the measuring surface being resiliently journalled in a direction parallel with the surface of the refining disc and being movable in said direction in the event of a stress force, in relation to a permanently inserted force sensor with which the measuring surface is connected, said force sensor thus being influenced by and measuring said stress force.

3. A method as claimed in claim 1 or claim 2, **characterized** in that the size and distribution of the output transferred to the material are calculated on the basis of the measured stress forces and that these calculations are then used to control the refining process.

4. A measuring device for measuring stress forces in refiners comprising refining discs that between them define a refining gap for refining material between bars (3) arranged on the refining discs, **characterized** in that said device comprises members (10) that measure the stress force across a measuring surface (7) constituting a part of a refining disc, in that said measuring surface comprises at least parts of more than one bar (3) and being resiliently mounted in relation to the surface of the refining disc.

5. A measuring device as claimed in claim 4, **characterized** in that it comprises a force sensor (10) and a body (17) that connects said sensor to the measuring surface (7).

6. A measuring device as claimed in claim 5, **characterized** in that the force sensor (10) abuts said body (17) while at the same time being fixed in relation to said body by means of attachment means (20).

7. A measuring device as claimed in claim 6, **charact riz d** in that it comprises members (12, 17) for resilient journalling of the measuring surface in a direction essentially parallel with the surface of the refining disc.

8. A measuring device as claimed in claim 7, **characterized** in that the measuring surface (7) is connected to said body (17) and in that, furthermore, the part of said body that extends on the side of the force sensor (10) opposite to the measuring surface, is provided with a joint (8) where the body is movable in a direction substantially parallel with the surface of the refining disc.

9. A measuring device as claimed in claim 8, **characterized** in that the body (17) is substantially circular in cross section and that the joint (8) is formed by a part of the body, located below the force sensor (10), being flattened.

10. A measuring device as claimed in any of claims 5-9, **characterized** in that the force sensor (10) is a piezoelectric sensor.

11. A measuring device as claimed in any of claims 4-10, **characterized** in that said measuring surface (7) constitutes a part of the measuring device and that the measuring surface is surrounded by a sealing member (12) by which it is joined to surrounding parts of the measuring device, and which sealing member (12) is made of a somewhat yielding material.

12. A measuring device as claimed in claim 11, **characterized** in that it comprises a casing (22), that the force sensor (10) and the body (17) are arranged inside said casing, that the force sensor is attached inside the casing by means of said attachment means (20) and is thus secured in relation to said body, that one end of the body, opposite to the end joined to the measuring surface, is secured in the casing and that the casing is closed by means of the measuring surface (7) and the sealing member (12).

13. A measuring device as claimed in claim 12, **characterized** in that the sealing member is arranged in a sleeve (13) which sleeve, with the sealing member (12) and measuring surface (7), is inserted in the casing (22) in order to seal the casing.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/01257

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B02C 7/14, D21B 1/14, D21D 1/30
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B02C, D21B, D21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SE 407952 B (DEFIBRATOR AB), 30 April 1979 (30.04.79), figures 1,2, claims 1,2	1,4

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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 October 2000	18 -10- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Wiva Asplund/ELY Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

03/10/00

International application No.
PCT/SE 00/01257

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